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## ON THE PHOTOMETRIC COMPARISON OF LIGHT OF DIFFERENT COLORS.

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THE comparison of the intensities of light of different colors has long been considered one of the most difficult of photometric problems, but by the use of very simple means, I have recently made a series of measurements of this character, which may not be without interest to those whose studies lie in this direction. The luminosity of card-board painted with vermillion, was, for example, measured as follows: a circular disc of the vermillion card-board was attached to the axis of a rotation-apparatus, smaller circular discs of black and white card-board being simultaneously fastened on the same axis, so that by varying the relative proportions of the latter, a series of grays could be produced at will.

The compound black and white disc was now arranged so as to furnish by rotation a gray which was *decidedly darker* than the vermillion; this gray tint was then gradually lightened, till the observer became doubtful as to the relative luminosities of the red and gray discs; the angle occupied by the white sector was then measured. Next, a gray *decidedly more* luminous than the vermillion was compared with it, and diminished in brightness till the observer again became doubtful, when a second measurement was taken. All this time the manipulation was performed by an assistant, the experimenter giving directions, but remaining in ignorance of the results to the end. The mean of ten such experiments assigned to the vermillion disc a luminosity of 23·8, that of white card-board being taken

as 100. In this experiment and in all those that follow, proper corrections were made for the amount of white light reflected by the black disc, this having been previously ascertained, in a manner which will be described in a future communication.

In order to test the correctness of the final result, the luminosity of a blue-green disc, correctly complementary in color to the vermillion, was next measured in the same way; it proved to be 26·56. The vermillion and blue-green discs were then combined, according to Maxwell's method, so as to obtain a pure gray by rotation, and the angular proportions of these colored surfaces, and the value of the gray in terms of white and black card-board, measured. The gray thus obtained had a luminosity of 24·54, that of white card-board being 100. Next, the value of this same gray was *calculated* from the measured luminosities of the two colored discs, and the proportions of these colors required to produce a pure gray by mixture on the rotation apparatus; the calculated value was 25·47.

This agreement proves the correctness of the photometric comparison, and also of Grassman's assumption, that the total intensity of the mixture of masses of differently colored light is equal to the sum of the intensities of the separate components, which, so far as I know, has not before received an experimental confirmation.

Corresponding measurements were made with a green, and its complementary purple disc; also with a blue, and its complementary yellow disc; the results are given below.

	Luminosity.	Gray (observed.)	Gray (calculated.)
Vermilion, -----	23·8	24·54	25·47
Blue-green, -----	26·56		
Chrome yellow, -----	80·3	54·51	53·92
Cobalt blue, -----	35·38		
Green, -----	41·19	24·94	26·56
Purple, -----	14·83		



